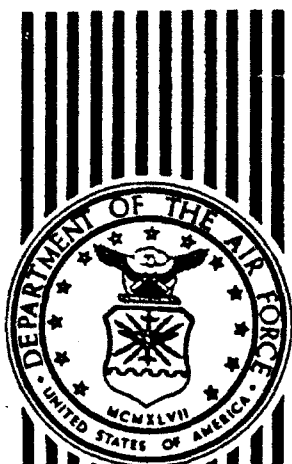


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ESL-TR-89-04



SUBSTITUTION OF WAX AND GREASE CLEANERS WITH BIO-DEGRADABLE SOLVENTS: PHASE I, PART II

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SEPTEMBER 1989

FINAL REPORT

OCTOBER 1987 — SEPTEMBER 1988

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19. ABSTRACT (Continue on reverse if necessary and identify by block number) Methods have been tested for systematic evaluations of biodegradable solvents for aircraft parts cleaning, degreasing, and masking-wax removal processes. Screening tests have identified solvents that are biodegradable, can efficiently remove soils from aircraft parts in a dip tank, and meet the military specification requirement for corrosiveness (ANSI/ASTM) in processes used at the five Air Force Air Logistics Centers (ALCs). The database developed during Phase I, of this program identifies each process, the chemicals used, tank volumes, testing requirements, and alternative chemicals. To test solvent biodegradability, an ASTM method was modified and used to test a bench-scale activated sludge system by measuring chemical oxygen demand (COD) and adenosine triphosphate (ATP) over a 6-hour period to determine if the bacteria will reduce COD to below the limit established by the National Pollution Discharge Elimination System (NPDES). Solvents were categorized to identify any trends, and six were selected for in-depth pilot-scale testing.				
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PREFACE

This report was prepared by Idaho National Engineering Laboratory, EG&G Idaho, Inc., P.O. Box 1625 Idaho Falls, Idaho 83415 under Contract Number DE-AC07-76ID01570 for the Air Force Engineering and Services Center (AFESC), Tyndall Air Force Base, Florida 32403-6001. Mr Charles J. Carpenter was the Government technical program manager. This report summarizes work accomplished between 1 October 1987 and 30 March 1989.

This report has been reviewed by the Public Affairs Office and is releasable to the National Technical Information Service (NTIS). At NTIS it will be available to the general public, including foreign nations.

This technical publication has been reviewed and is approved for publication.


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APPENDIX A

DETAILED BIODEGRADABILITY PROTOCOL

APPENDIX A

DETAILED BIODEGRADABILITY PROTOCOL

The following pages contain the detailed procedures followed for testing solvents for biodegradation in an activated sludge system.

A. TEST CONFIGURATION

The activated sludge from Tinker AFB is maintained in a culture column with air circulation, with siphon activated maximum volume overflow wasting, and with constant nutrient additions. Solids are maintained at approximately 2.5 grams/liter. The test configuration (columns) is shown in Table A-1 below.

TABLE A-1. TEST CONFIGURATION

Time (hours)	1	2	3	Test Columns		6 (Phenol)
				4	5	
0	2F ^a 2ATP ^b	2F 2ATP	2F 2ATP	2F 2ATP	2F 2ATP	2F 2ATP
1	2F 2UF ^c	2F	2F	2F	2F	2F
2	2F	2F	2F	2F	2F	2F
3	2F	2F	2F	2F	2F	2F
4	2F	2F	2F	2F	2F	2F
5	2F 2UF	2F	2F	2F	2F	2F
6	2F 2ATP	2F 2ATP	2F 2ATP	2F 2ATP	2F 2ATP	2F 2ATP

a. 2F = 2 filtered (2-mL) samples for COD analysis.

b. 2ATP = 2 unfiltered (1-mL) samples for adenosine triphosphate.

c. 2UF = 2 unfiltered (2-mL) samples for COD analysis.

B. SOLIDS

Activated sludge, brought to this lab from Tinker AFB's IWTP, is concentrated by centrifugation at 5°C and 5000 rpm. The elutriant is discarded and the pellet is collected in a container which is stored in a refrigerator at 5°C. The moisture content of the concentrated sludge is determined by adding 1.0 grams of wet concentrated sludge to a

preweighed pan. The material is dried to a constant weight at 105°C in a drying oven. The percent of solids is determined by:

$$\frac{\text{dry weight}}{\text{wet weight}} \times 100 = \% \text{ solids}$$

This value is used to determine the amount of concentrated sludge added to the column.

$$\frac{2.5 \text{ grams solids/liter}}{\% \text{ Solids}} \times 4 \text{ liters of column} = \text{amount of wet solids added to the column}$$

C. COLUMN SETUP

- o Four liters of dilution medium is added to the column, and air agitation is turned on.
- o Agitation is continued for 5 minutes to permit mixing and oxygenation of the solution prior to the addition of solids.
- o The preweighed solids are added to the column.
- o Nutrient feed is started to the column.
- o Following 1/2 hour mixing period, a 50 mL sample is pulled in a glass beaker, a magnet bar is added, and the sample is placed on a stirring plate. The pH of the solution is measured using a calibrated pH probe. This solution is then discarded.
- o A 25 mL sample of the culture column material is added to a preweighed drying tin. The sample is placed in a 105°C drying oven and dried to a constant weight.

Comments:

The air flow in the column should be adjusted to prevent excessive bumping, but adequate mixing.

Check all feed and waste discharge lines for proper flow.

Prepare a slide for microscopic observation of the column material.

D. DILUTION MEDIUM

The EPA nutrient medium used for maintaining the activated sludge is made of the following materials (see Table A-2).

- 1 liter deionized water (DIW)
- 1 milliliter solution I
- 1 milliliter solution II
- 1 milliliter solution III

TABLE A-2. DILUTION MEDIUM COMPOSITION

Solution	Compound	g/L
I	NH ₄ Cl	35
	KNO ₃	15
	K ₂ HPO ₄ ·3H ₂ O	75
	NaH ₂ PO ₄ H ₂)	25
II	KCl	10
	MgSO ₄	20
	FeSO ₄ ·7H ₂ O	1
	(adjust pH to 3.0)	
III	CaCl ₂	5
	ZnCl ₂	0.05
	MnCl ₂ ·4H ₂ O	0.5
	CuCl ₂	0.05
	CoCl ₂	0.001
	H ₃ BO ₃	0.001
	MoO ₃	0.0004

*Federal Register (September 27, 1985), volume 50, number 188, page 39279.
Refrigerate the solutions.

E. NUTRIENT SUPPLEMENT PREPARATION

The following addresses the nutrient feed solution of phenol, nitrogen, and phosphorus added daily. The ratio of 10:5:1 (C:N:P) is the operating premise. Iron is added as an additional supplement for good floc growth.

The average phenol feed is assumed to be 100 ppm (similar to pilot plant maintenance feed requirements). The feed rate of 16 L per day would offer a 4.0 turnover rate of the column (4 L volume), similar to the pilot plant and IWTP at Tinker AFB.

100 ppm - carbon, (100 mg/liter)(16.0 liters)	= 1.60 g C/day
50 ppm - nitrogen, (50 mg/liter)(16.0 liters)	= 0.80 g N/day
10 ppm - phosphorus, (10 mg/liter)(16.0 liters)	= 0.16 g P/day
5 ppm - iron, (5 mg/liter)(16.0 liters)	= 0.08 g Fe/day

For the source of carbon, phenol is added at a rate of 1.60 grams of phenol daily.

Ammonium chloride (NH_4Cl) is used as the source of nitrogen. The nitrogen in ammonium chloride represents approximately 26% of the formula weight; therefore, $(0.8 \text{ grams N/Day}) / (26\% \text{ N}/\text{NH}_4\text{Cl}) = \underline{3.077\text{-grams NH}_4\text{Cl/day}}$ is required in the nutrient feed.

Potassium phosphate (KPO_4) is used as the source of phosphorus. The phosphorus in potassium phosphate represents approximately 13% of the formula weight; therefore, $(0.16 \text{ grams P/day}) / (13\% \text{ P}/\text{KPO}_4) = \underline{1.231\text{-grams KPO}_4/\text{day}}$ is required in the nutrient feed.

Ferric Chloride (FeCl_3) is used as the source of iron. The iron in ferric chloride represents approximately 34.5% of the formula weight; therefore, $(0.08\text{-grams Fe/day}) / (34.5\% \text{ Fe}/\text{FeCl}_3) = \underline{0.232\text{-grams FeCl}_3}$ is required in the nutrient feed.

F. FEED/FLOW RATE CALCULATIONS

Based on a feed flow rate of 0.75 mL/min, the amount of materials needed to be in a liter of the biodegradation solution can be calculated by:

$$(0.75 \text{ mL/min})(60 \text{ min/hour})(24 \text{ hours/day}) = 1080 \text{ mL/day, or } 1.08 \text{ Liters/day}$$

Therefore, in making up the nutrient feed for the columns, the following compounds must be added in the amount indicated.

$$\frac{(1.60 \text{ g Phenol/day})}{(1.08 \text{ L/day})} = \underline{1.481 \text{ g/L}}$$

$$\frac{(3.077 \text{ g Ammonium Chloride/day})}{(1.08 \text{ L/day})} = \underline{2.849 \text{ g/L}}$$

$$\frac{(1.231 \text{ g Potassium Phosphate/day})}{(1.08 \text{ L/day})} = \underline{1.140 \text{ g/L}}$$

$$\frac{(0.232 \text{ g Ferric Chloride/day})}{(1.08 \text{ L/day})} = \underline{0.215 \text{ g/L}}$$

Volume Prepared (liters)	Phenol (grams)	Ammonium Chloride (grams)	Potassium Phosphate (grams)	Ferric Chloride (grams)
1	1.481	2.849	1.140	0.215
2	2.962	5.698	2.280	0.430
3	4.443	8.547	3.420	0.645

- o The ammonium chloride, potassium phosphate (monobasic), and ferric chloride are added to the basic nutrient media.
- o The solution is sterilized, 121°C, 20 psi, 20 minutes
- o The solution is cooled to room temperature, and
- o The phenol additive is prepared by:
 - a) dissolve phenol in 50 mL of deionized water
 - b) filter sterilize.
- o Add the phenol to the media.
- o The nutrient media is attached, aseptically, to the nutrient feed pump.

G. TEST SET-UP PROCEDURES

During the biodegradation test, the basic EPA nutrient medium is used to dilute the solvent and culture material in the test columns.

The test columns are filled to a total volume of about 250 mL's

- o 0.417 mL of most concentrated manufacturer's recommended mix of solvent (based on a 1:600 dilution, which is a typical IWTP dilution ratio at Tinker AFB)
- o 225 mL's of solvent and basic EPA nutrient media (appropriate dilution, concentration).
- o 25 mL's of culture column microorganisms

COD determinations are run according to HACH Chemical procedures.

ATP determinations are run according to the internal standard method of Turner Instruments, Inc.

2 mL samples are filtered using a syringe-filter system equipped with a 0.45 micron pore-size filter.

Dry weights are determined on the culture column and initial samples at the beginning and end of the test runs. Twenty-five mL samples of material are placed in a preweighed drying pan which is placed in a drying oven (103°C) until the sample is dry. The pan is reweighed, and the difference between the initial and final pan weights divided by the volume placed in the drying pan gives solid dry weights per unit volume.

COD values are compared to a control phenol column run simultaneously during each test period.

Also, COD values are compared to each other based on solid dry weights, ATP, and relative phenol degradations.

H. ATP PROCEDURE

Set ATP Photometer: 3-second delay, 10-second integration period

Reading Unknown (RU)

1. 50- μ L sample in 8 X 50 mm polypropylene tube
2. Add 50 μ L releasing agent, mix, and let stand 30 seconds
3. Add 50 μ L HEPES buffer
4. Place in photometer
5. Inject 100 μ L Luciferin-Luciferase (L&L)
6. Record full integral

Reading Internal Standard (RIS)

1. 50- μ L sample in 8 X 50 mm polypropylene tube
2. Add 50 μ L Releasing Agent, mix, and let stand 30 seconds
3. Add 50 μ L ATP Standard, 2.5-E-2 μ G/mL ATP
4. Place in photometer
5. Inject 100 μ L Luciferin-Luciferase (L&L)
6. Record full integral

Reading the Blank (RB)

1. 50- μ L sample in 8 X 50 mm polypropylene tube
2. Add 50 μ L releasing agent, mix, and let stand 30 seconds
3. Add 50 μ L HEPES buffer
4. Place in photometer
5. Inject 100 μ L Luciferin-Luciferase (L&L)
6. Record full integral

Reagents

Releasing Agent - purchased, ready-to-go from Turner Designs, Inc.
HEPES buffer - purchased, ready-to-go from Turner Designs, Inc.

ATP Standard - purchased as a concentrated, sterile liquid from Turner Designs, Inc., see the following page for preparation details
Luciferin-Luciferase - purchased as a sterile, dry powder (5.5 mL preparation volume) from Turner Designs, Inc., see the following page for preparation details

KEEP ALL REAGENTS REFRIGERATED AND COOLED

ATP STANDARD SHOULD BE FROZEN BETWEEN TESTING PERIODS

DISCARD ANY THAWED L&L FOLLOWING THE DAILY TEST PERIOD

I. ATP STANDARDS PREPARATION

1. Fill dewar with liquid nitrogen.
2. Calibrate 100- μ pipet (Eppendorf) to deliver 25 μ L, by weight using the microbalance, 0.2500 grams/10 deliveries.
3. Use a 10-mL volumetric pipet to deliver 10-mL of sterile HEPES buffer into five clean plastic tubes.
4. Pipet 25 μ L of ATP Standard (5-mL bottle, blue label, liquid, Turner Designs) into each 10-mL tube.
5. Vortex mix each tube following the addition of the ATP Standard.
6. Pipet 2 mL of the diluted standard into blue, snap cap tubes.
7. Place the 2 mL ATP Standards in the liquid nitrogen.
8. Continue steps 5 - 8 until the five test tubes of HEPES buffer have been used.
10. Remove the prepared standards from the liquid nitrogen and place them in a labeled beaker (indicating the date of preparation and the people who prepared them) and place the beaker in the freezer.

J. LUCIFERIN-LUCIFERASE PREPARATION

1. Remove 5 or 6 bottles of L&L (green labels, Turner Designs) from the refrigerator.
2. Using a 10-mL syringe (calibrated to 0.2 mL volume), add 5.5 mL of sterile HEPES buffer to 3 of the bottles of L&L.
3. Using a 1 mL pipet, transfer 1 mL of the L&L into a blue, snap-cap, conical plastic tube.
4. Close the cap and place the tube in liquid nitrogen.
5. After all of the bottles have been made up, remove the prepared L&L tubes from the liquid nitrogen and place them in a labeled beaker (indicating the date of preparation and the people who prepared them) and place the beaker in the freezer.

K. COD STANDARD PREPARATION

Do not add dry chemical or strong acid/base to a dry volumetric flask; therefore, add approximately 10 mL of nanopure water to 3-100 mL volumetric flasks.

Mark one of the three volumetric flasks as number "1". This is the initial solution flask. Mark the other two flasks as "A" and "B". These will be the two standards, actually measured.

1. Initial Solution

- o Weigh out 9.80 grams of ferrous ammonium sulfate (FAS) and add this to the volumetric flask.
- o Using a 2-mL volumetric pipet, transfer 2 mL of concentrated sulfuric acid to the volumetric flask.
- o Bring the volume in the volumetric flask to about 3/4 total volume.
- o Swirl the flask until all of the FAS crystals have dissolved.
- o Bring the flask volume to the mark with nanopure water and seal with parafin
- o Invert the volumetric at least 13 times, allowing the neck to fill and empty completely each time (rotate the flask slightly each inversion also).

2. Standard Solution A

- o Using the Solution 1, fill a 10-mL volumetric pipet to just above the mark.
- o Empty the pipet into a large volume waste beaker.
- o Draw a second volume of a solution to the mark and transfer this volume to the volumetric flask labeled "A".
- o Fill the volumetric flask to the mark with nanopure water, seal with parafilm, and invert at least 13 times (same as making the initial solution).
- o Rinse a small, clean, plastic weigh boat with this solution.
- o Discard the rinse into the waste beaker.
- o Fill the weigh boat again with this solution and transfer 2 mL's of this solution to two separate COD analysis tubes.
- o Vortex the tubes and place them in the COD incubator.

3. Standard Solution B

Using Solution 1, fill a 25-ml volumetric pipet to just above the mark.

Empty the pipet into a large volume waste beaker.

Draw a second volume of a solution to the mark and transfer this volume to the volumetric flask labeled "B".

Fill the volumetric flask to the mark with nanopure water, seal with parafilm, and invert at least 13 times (same as making the initial solution).

Rinse a small, clean, plastic weigh boat with this solution.

Discard the rinse into the waste beaker.

Fill the weigh boat again with this solution and transfer 2 mL of this solution to two separate COD analysis tubes.

Vortex the tubes and place them in the COD incubator.

NOTES:

When you are through with the solutions prepared for COD analysis:

- a. Discard remaining solutions into the waste solution beaker.
- b. Add an equal amount of water to dilute the acidic solution.
- c. Neutralize and discard this solution (it is only an iron precipitate).
- d. Rinse the volumetric flasks (fill and dump) three times with tap water.
- e. Wash the outside of the volumetric flasks with soap and hot water.
- f. Rinse the volumetric flasks (fill and dump) three times with tap water.
- g. Rinse the volumetric flasks (fill and dump) three times with deionized water.
- h. Rinse the volumetric flasks (fill and dump) three times with nanopure water.
- i. Invert the volumetric flasks and place them on a drying rack.

L. BASIC CALCULATIONS

$$\text{ATP in sample (g/mL)} = \frac{(\text{RU} - \text{RB})}{(\text{RIS} - \text{RU})} \times \text{ATP in standard* (g/mL)}$$

$$\text{Solids in sample (g/mL)} = \frac{\text{pan dry weight (final-initial, grams)}}{\text{volume of sample (mL)}}$$

$$\text{ATP per gram solids (g/g)} = \frac{\text{ATP in sample}}{\text{Solids in sample}}$$

* 2.5×10^{-8} g ATP/mL (Standard concentration currently prepared).

APPENDIX B

CHEMICAL COMPANIES CONTACTED

APPENDIX B

CHEMICAL COMPANIES CONTACTED

The following pages list the chemical companies that were contacted in order to establish what possibly biodegradable solvents are presently available. This list was compiled through personal conversations and the Thomas Register.

BIODEGRADABLE PROJECT
COMPANIES CONTACTED LIST

3 D INC.
AAZ WESTERN FACTORY SUPPLY
ACME CLEANING EQUIPMENT
ADVANCE AEROSOL & CHEMICAL CO.
ALEXANDER CHEMICAL CO.
ALLIED SIGNAL INC
AMERICAN NIAGARA CORP.
AMREP INC.
ARCO CHEMICAL CO.
ASHLAND CHEMICAL CO.
ASHLAND OIL INC.
ATLANTIC RICHFIELD CO.
AURIC CORP.
BARON BLAKESLEE INC.
BARTLETT CHEMICALS INC.
BASF CORP. DEPT. 131-T
BEACON CHEMICAL CO. INC.
BEAM CHEMICAL CO. INC.
BEAVER ALKALI PRODUCTS
BETTER ENGINEERING MFG.
BIO-TEK INC.
BROWNING-FERRIS INDUSTRIES
BRULIN & CO.
BUILD-ALL CORP.
BURMAH TECHNICAL SERVICES
BY PASS OF AMERICA
CABOT CHEMICAL CORP.
CALIFORNIA CHEMICAL CO.
CALLA CHEMICAL OPERATION
CAPCO ENTERPRISES LTD.
CHEM POWER MFG.
CHEMDET INC.
CHEMICAL PRODUCTS, HOLT LLOYD CORP.

CHEMOK CORP. SUB. OF HI PORT INDUSTRIES
CHEMTRONICS INC.
CHEVRON
CHRYSLER CORP.
CIRCUIT CHEMISTRY CORP.
CLEMCO IND.
CRAIN CHEMICALS CO. INC.
CRC DIST/TWIN SPECIALISTS CORP.
CROWLEY CHEMICAL COMPANY
CRYSTAL REFINING CO.
DALCO INDUSTRIES LTD.
DARMEX
DELL MARKING SYSTEMS INC.
DETREX CORP.
DIAMOND SHAMROCK CORP.
DIVERSEY WYANDOTTE CORP.
DOBER CHEMICAL CORP.
DOW CHEMICAL CO
DREW INDUSTRIAL DIVISION
DU PONT DE NEMOURS
DUNBAR SALES & MFG.
EFCOR FAMILY OF COMPANIES
ELGENE CHEMICALS INC.
ENTHONE INC.
ESSCO CHEMICALS INC
ETHYL CORP.
EUREKA CHEMICAL CO.
EXXON CHEMICAL CO.
FINE ORGANICS CORP
FORMULA IV CORPORATION
FOSTER & COMPANY INC.
FREDERICK GUMM CHEMICAL CO.
FREMONT INDUSTRIES
GAF CORP.
GAMAGET EQUIPMENT, DIV SYBRON CHEMICALS INC.
GENERAL TEXAS CORP.

GETTY REFINING CO.
GIVANDEN CORP.
GOODRICH PROJUCT DIV.
GRANT CHEMICAL DIV., FERRO CORP
GRAYMILLS CORP.
GREAT VALLEY INDUSTRIES INC.
HACHET PETROLEUM CO.
HOLT LLOYD CORP.
HOMESTEAD INDUSTRIES INC.
HOOKER CHEMICAL, INDUSTRIAL CHEMICALS GROUP
HORIZON CHEMICALS INC.
HUKILL CHEMICAL CORP.
HUNTINGTON LABORATORIES
HY-KO ENVIRO-MAINTAINANCE PRODUCTS
HYDRITE CHEMICAL CO.
HYDROTEX INC.
HYLUBE INC.
INDUSTRIAL CHEM LABS
INDUSTRIAL CHEMICAL PRODUCTS
INDUSTRIAL SOAP CO.
INDUSTRIAL SOLVENTS CORP.
INSTA-CLEAN INC.
INTERNATIONAL PRODUCTS CORP.
JET-LUBE INC.
JOHNSON WAX/GEM STATE PAPER
JONES & LAUGHLIN STEEL CORP.
K&S ALL PURPOSE PRODUCTS
KANO LABORATORIES INC.
KELLOGG, E.H. AND CO. INC.
KENDALL/AMALIE DIV WITCO CORP.
KIESOW INTERNATIONAL CORP.
KLEAN STRIP, DIV W.M. BARR & CO. INC.
KLEER-FLO COMPANY
KLEM CHEMICAL CORP.
KUTOL PRODUCTS CO.
KWICK KLEEN INDUSTRIAL SOLVENTS

LAKE PRODUCTS CO. INC.
LEA MANUFACTURING CO.
LOCTITE CORP.
LONDON' CHEMICAL CO.
LPS CHEMICAL PRODUCTS
LUFKIN CORP.
M-OIL-FREE CO.
MACDERMID CORP.
MADISON BIONICS
MAGIE BROS. OIL CO.
MAGNA IND. CO. LTD.
MAGNUS DIV OF ECONOOMICAL LABORATORY INC.
MAGNUS MERITEC INTERNATIONAL
MAGNUSON PRODUCTS
MAN-GILL CHEMICAL
MCGEAN-ROHCO INC.
MEQQEM
MICHIGAN INDUSTRIAL FINISHES CORP.
MILLER, HARRY, CORP.
MITCHELL-BRADFORD CHEMICAL CO.
MONTGOMERY CHEMICALS CO.
MORGAN CHEMICALS INC.
MULTI-CLEAN
NORTH COAST CHEMICAL CO
NORTON PETROLEUM CORP.
NOVOCOL CHEMICAL CO.
NUVITE CHEMICAL COMPOUNDS CORP.
OAKITE PRODUCTS INC.
OLIN CHEMICALS
ORANGE-SOL INC.
ORGANIC CHEMICAL DEV.
OVERDALE CORP.
PACE NATIONAL CORP.
PACIFIC CHEMICAL
PACLIN CHEMICAL CO
PANTHER CHEMICAL CO.

PARKER CHEMICAL CO.
PATCLIN CHEMICAL CO.
PAVCO INC.
PENETONE CORP.
PETROCON MARINE AND INDUSTRIAL CHEMICAL CORP.
PETROFIRM INC.
PHILLIPS MANUFACTURING CO.
PIERCE CHEMICAL CO.
PM PRODUCTS INC.
PPG INDUSTRIES INC., CHEMICAL GROUP
PRECISIONAIRE INC.
PROGRESS CHEMICAL INC.
PUREX CORP.
QUAKER OATS CHEMICALS
RADIATOR SPECIALTY CO.
RAWN CO. INC.
REICHOLD CHEMICALS INC.
REM CHEMICAL CO.
RESEARCH CHEMICALS
RHONE POULENC INC.
ROBBISH INDUSTRIAL PROD.
ROCHESTER MIDLAND
ROLY INTERNATIONAL
ROMINDA INC.
ROTO FINISH
RUST ELIMINATOR CO.
S.C. JOHNSON & SON
SECO CHEMICALS INC.
SEMCO DIV, PRODUCTS RESEARCH & CHEMICAL CORP.
SENTINEL SOAPA AND CHEMICAL CO.
SHELL CHEMICAL CO.
SPECTRON INC.
STANDARD OIL CO.
STARKEY CHEMICAL PROCESS CO.
STEPAN CO.
STERLING-CLARK-LURTON CORP.

SUN REFINING & MARKETING CO.
SURFACE DYNAMICS USA INC.
SUTTON CORP.
SWI INTERNATIONAL INC.
TELSTAR INDUSTRIES, INC.
TOWER CHEMICAL CORP.
TRUESDALE CO.
TURCO PRODUCTS
TWIN SPECIALTIES CORP.
U.S. POLYCHEMICAL CORP.
U.S.I. CHEMICALS, DIV OF NATIONAL DISTILLERS AND C
UNION CHEMICALS DIV., PETRO CHEMICAL GROUP
UNIQUE INDUSTRIES INC.
UNITED LABORATORIES INC.
UNOCAL CORP.
VALESKA SOVENTS INC.
VALVE LINE LABORATORIES
VAN STRAATEN CHEMICAL CO.
VIRGINIA CHEMICALS INC.
VIRGINIA KMT
VISTA CHEMICAL CO.
WARNER-GRAHAM CO.
WASTE REASEARCH & RECLAMATION CO.
WESTERN CHEMICAL CO.
WITCO CORP
WORLD LABORATORIES
** Z
ZEP MFG. CO.
ZIEBART PRODUCTS

APPENDIX C

COMPOUNDS CHOSEN FOR EVALUATION

APPENDIX C

COMPOUNDS CHOSEN FOR EVALUATION

These pages contain the compounds with thorough discussions with manufacturers who were selected for testing.

BIODEGRADABLE SOLVENTS
PRODUCTS RECEIVED

** 3 D INC.

3D SUPREME
747 AIRCRAFT CLEANER
BRITE BOY
CITRIGOLD
RUST ERADICATOR
SIEGE

** AMERICAN NIAGARA CORP.

ACCUSOL S/T-20

** BARTLETT CHEMICAL INC.

DOLPHIN 281
DOLPHIN TPS CODE 219
DOLPHIN WSD CODE 207
TOBY CODE 230

** BIO-TEK INC.

122 QUIK
126 SONI-CLEAN
134 HI-SOLV
710 dry clean
SAFTEY SOLVENT DEGREASER

** BRULIN

711 SC
815 QR
AQUA SAFE
CL-500
FORMULA 512M
NATURE-SOL 100

** BUILD ALL

BAC #137

** CABOT CHEMICAL CORP.

X-166

** CALLA CHEMICAL CORP

CALLA 301

CALLA 301-A

CALLA 301-A-LEMON

CALLA 626B

CALLA 800

** CHEMIQUE INC

BAR-2-NU

ION-417X

ION-420/LC

KRC-7

** CIRCUIT CHEMISTRY CORPORA

NCN-CU A,B

** CROWLEY CHEMICAL COMPANY

AROMATIC SOLVENT #58

METHYL NAPHTHALENE #5

** DIVERSEY WYANDOTTE METALS

ALDET

DIVERCLEAN LTS

DIVERSEY WYADOTTE II

NUVAT

NUVAT LT

NUVAT NP

PORENAC

**** DOBER CHEMICAL CORP.**

4190

8679

CD-44

CD-44HD

**** DREW INDUSTRIAL DIVISION**

DREW OIL AND GREASE REM.

**** ELGENE CHEMICALS INC.**

#22 SKIDOO

A-CD

ECONOMISER CF

FABULENE

SAFETY SOLVENT #10

**** EXXON CHEMICALS**

AROMATIC 150

AROMATIC 200

EXSOL D 80

EXXAL 13 TRIDECYL ALCOHOL

EXXAL 16 -ISOCETYL ALCOHO

EXXAL 20

EXXAL L1315

EXXATE 1000

EXXATE 1300

EXXATE 600

EXXATE 700

EXXATE 800

EXXATE 900

EXXSOL D110

NORPAR 13

NORPAR 15

WS 2443 SOLVENT

WS 2444 SOLVENT

** FINE ORGANICS CORP
F.O. 2074

** FORMULA IV CORPORATION
MAGNA IV C-1000

** FREDERICK GUMM CHEM.
CLEPO 136-R
CLEPO 136-R
CLEPO 204
CLEPO 426-A
CLEPO 644-L
CLEPO 681-L
SONIC SOAK

** GRAYMILLS CORP.
AGITENE
AQUATENE 330
AQUATENE 571
AQUATENE 581

** HOLT LLOYD CORP.
CHEMPRO APC
CPS HEAVY DUTY CLEANER

** HOMESTEAD INDUSTRIES INC.
#49
#49-S
#65
AP
HDL

** HUNTINGTON
J8-10P
LHTS
ONLINE CE SD

SOLVENT EMULTION DEGREASE
THUNDER BOLT

** HYDRITE CHEMICAL CO.
HYDRI-CLEAN NPX

** HYLUBE INC.
ALKAKLEEN 658
HYKLEEN 300
HYKLEEN 312

** INTERNATIONAL PRODUCTS CO
MICRO

** JOHNSON WAX/GEM STATE PAP
BIG BARE
J-SHOP 500
J-SHOP 600

** KIESOW INTERNATIONAL CORP
EKASIT D-103
EKASIT E-231
EKASIT S-261

** KLEER-FLO COMPANY
DEGREASOL 99R
HI-T DEGREASER

** LAKE PRODUCTS CO. INC.
LAKE-97

** LEA MANUFACTURING CO.
CLEANOL

** M-OIL-FREE CO.
CITRIC

GS-A-67
M-OIL-FREE #1000
ULTRA
ULTRA 70
ULTRA 90

** MADISON BIONICS
CHEMERSE

** MAGNUSON PRODUCTS
PERMAG #404
** MAN-GILL CHEMICAL
MAGNUSOL 728

** MEQQEM
MEQQEM-CLEAN 8512
MEQQEM-CLEAN 8516

** MIRACHEM
MIRACHEM 100

** MITCHELL-BRADFORD, INTERN
MI-CLEAN 100
MI-CLEAN 14
MI-CLEAN 31
MI-CLEAN 59

** NORTH COAST CHEMICAL CO
CARBON REMOVER 730

** OAKITE PRODUCTS INC.
OAKITE 162
OAKITE 2327
OAKITE 24
OAKITE ANOPREP

OAKITE DYNADET
OAKITE HD 126

** ORANGE-SOL INCORPERATED
DE-SOLV-IT

** PACIFIC CHEMICAL
FIST
MASTER MHW
PACE S-L
RIDDALL

** PANTHER CHEMICAL CO.
759
AS-33
CR-138
CR-140
RR 50

** PARKER CHEMICAL
PARCO CLEANER 2033
PARCO CLEANER 2053

** PATCLIN CHEMICAL CO.
#309
#348
#380
#490
330 BEC

** PENETONE
CITRI KLEEN

** PETROFIRM INC.
BIOACT INDUSTRIAL DG1

** PROGRESS CHEMICAL INC.

#611

#65

AC-1

L-365

** ROCHESTER MIDLAND

SE377C

** SUTTON CORP.

TOPSALL

** TELSTAR INDUSTRIES

TELE-SOLV

TOWER 270

** TITAN CHEMICAL

OIL-FLO

** TRI TON

HEMO-SOL

** TWIN SPECIALTIES CORP.

CLEANER 54-TWIN INDUSTRIA

TWIN CITRON CLEANER 100

** U.S. POLYCHEMICAL CORP.

ST-21 POLY SPRAY JET

** UNITED LABORATORIES

UNITED 392

UNITED 395

** VAN STRAATEN CHEM CO.

21-271-A

3625

VANSTAATEN CUTTER

** VIRGINIA KMT

VIRGINIA-10

** ZEP MANUFACTURING CO.

BIG ORANGE

ZEP 940

ZEPRIDE

APPENDIX D

RECOMMENDED CONDITIONS

These pages contain the conditions at which, initially, each compound was tested. These conditions were received directly from the manufacturer

3 D INC.

3D SUPREME

INGREDIENT --- DIPROPYLENE GLYCOL, MONOMETHYL ETHER

APPLICATION -- GREASE, OIL, CARBON, WAX

METALS ----- STEEL, Cr, Cd, BRONZE, IRON, Ni, Cu, SS, Pb, BRASS, Al

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1-3	140
1-3	160
1-3	180

3 D INC.

747 AIRCRAFT CLEANER

INGREDIENT --- DETERGENT

APPLICATION -- SOILS

METALS ----- Al, Cd, PLATE

SUGGESTED CONCENTRATIONS	TEMPERATURE °F

3 D INC.

BRITE BOY

INGREDIENT --- POTASSIUM HYDROXIDE

APPLICATION -- GREASE, CIL, WAX, CARBON

METALS ----- AL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F

3 D INC.

CITRIGOLD

INGREDIENT --- ORANGE OIL BASE

APPLICATION -- GREASE, OIL, CARBONIZED OIL

METALS ----- STEEL, Cr, Cd, BRONZE, Fe, Ni, Cu, SS, BRASS, Al

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:1	140
1:1	160
1:1	180
CONCENTRATE	140
CONCENTRATE	160
CONCENTRATE	180

3 D INC.

RUST ERADICATOR

INGREDIENT ---

APPLICATION -- RUST

METALS ----- STEEL, SS, Fe

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1-1	75
1-1	140
1-1	200

3 D INC.

SIEGE

INGREDIENT --- DIPROPYLENE GLYCOL MONOMETHYL ETHER

APPLICATION -- MULTIPURPOSE

METALS ----- STEEL, Cr, Cd, BRONZE, Fe, Ni, Cu, SS, Pb, BRASS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:4	160

BARTLETT CHEMICAL INC. DOLPHIN 281

INGREDIENT --- PROPYLENE GLYCOL METHYL ETHER
APPLICATION -- HEAVY CLEANING
METALS ----- NONE SPECIFIED

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:1	AMBIENT
1:4	AMBIENT

BARTLETT CHEMICAL INC. DOLPHIN TPS CODE 219

INGREDIENT --- ACIDS, STRONG ALKALINES
APPLICATION -- OIL, DEGREASEING
METALS ----- ALL METALS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:10	AMBIENT
1:20	AMBIENT

BARTLETT CHEMICAL INC. DOLPHIN WSD CODE 207

INGREDIENT --- PROPYLENE GLYCOL METHYL ETHER
APPLICATION -- SOIL, GREASE, OIL
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
4 OZ/GAL	160

BARTLETT CHEMICAL INC. TOBY CODE 230

INGREDIENT --- PROPYLENE GLYCOL METHYL ETHER
APPLICATION -- HEAVY CLEANING
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:3	AMBIENT
1:10	AMBIENT

BIO-TEK INC. 122 QUIK

INGREDIENT --- 2-BUTOXYETHANOL
APPLICATION -- OIL, GREASE
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F

BIO-TEK INC. 126 SONI-CLEAN

INGREDIENT --- 2-BUTOXYETHANOL, ANIONIC SURFACTANTS
APPLICATION -- ALL PURPOSE
METALS ----- ALL
ULTRASONIC CLEANER

SUGGESTED CONCENTRATIONS	TEMPERATURE °F

BIO-TEK INC.

134 HI-SOLV

INGREDIENT --- ALKYL ACETATE ESTERS
APPLICATION -- DEGREASER
METALS ----- ALL

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

BIO-TEK INC.

SAFTEY SOLVENT DEGREASER

INGREDIENT --- ALKYL ACETATE ESTERS
APPLICATION -- DEGREASER
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

BLUE GOLD

BLUE GOLD

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

NO SUGGESTED CONCENTRATION

BRULIN

711 SC

INGREDIENT --- ETHANOLAMINE, 2-AMINOETHANOL, MONOETHANOLAMINE
APPLICATION -- OIL, GREASE
METALS ----- ALL
NOT AL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:3	130
1:3	150

BRULIN

815 QR

INGREDIENT --- ETHANOLAMINE, 2-AMINOETHANOL MONOETHANOLAMINE
APPLICATION -- OIL, GREASE
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:20	160
1:20	180
1:20	200
1:10	160
1:10	180
1:10	200

BRULIN

AQUA SAFE

INGREDIENT --- DIPROPYLENE GLYCOL METHYL ETHER 2 PROPANOL, 1 METHOXY;
YENE GYLCOL METHYL ETHER
APPLICATION -- GREASE OIL
METALS ----- STEEL, Al, Cu, BRASS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:5	160
1:10	160

BRULIN

CL-500

INGREDIENT --- SODIUM HYDROXIDE CAUSTIC SODA
APPLICATION -- CARBON REMOVER
METALS ----- NONE SPECIFIED

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
4 OZ/GAL	180
4 OZ/GAL	210
6 OZ/GAL	180
6 OZ/GAL	210
8 OZ/GAL	180
8 OZ/GAL	210

BRULIN

FORMULA 512M

INGREDIENT --- NAPHTHALENE, 2-BUTOXYETHANOL, GLYCOL MONOBUTYL ETHER
APPLICATION -- OIL, GREASE
METALS ----- NONE SPECIFIED

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:4	150
1:10	150

BRULIN

NATURE-SOL 100

INGREDIENT --- DIPROPYLENE GLYCOL METHLY ETHER
APPLICATION -- GREASE, OIL, WAX
METALS ----- NONE SPECIFIC

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
CONCENTRATE	AMBIENT
1-3	AMBIENT

BUILD ALL

BAC #137

INGREDIENT --- POTASSIUM HYDROXIDE, SODIUM NITRATE
APPLICATION -- OILS, SOILS
METALS ----- ALL
MAY STAIN Mg

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
4%	90
4%	120
4%	150
7%	90
7%	120
7%	150
10%	90
10%	120
10%	150

CABOT CHEMICAL CORP. X-166

INGREDIENT --- PROPRIETARY
APPLICATION -- OIL, GREASE
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:50	AMBIENT
1:20	AMBIENT

CALLA CHEMICAL CORP CALLA 301

INGREDIENT --- BUTOXYETHANOL, POTASSIUM HYDROXIDE
APPLICATION -- GREASE, OIL, CARBON
METALS ----- ALL METALS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:1	100
1:4	140

CALLA CHEMICAL CORP

CALLA 301-A

INGREDIENT --- BUTOXYETHANOL, POTASSIUM HYDROXIDE
APPLICATION -- GREASE, OIL, CARBON
METALS ----- ALL METALS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:4	120
1:1	100

CALLA CHEMICAL CORP

CALLA 301-A-LEMON

INGREDIENT --- BUTOXYETHANOL, POTASSIUM HYDROXIDE
APPLICATION -- GREASE, OIL, CARBON, WAX
METALS ----- ALL METALS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:4	120
1:1	100

CALLA CHEMICAL CORP

CALLA 800

INGREDIENT --- POTASSIUM HYDROXIDE
APPLICATION -- OIL GREASE EXHAUST STAINS
METALS ----- NONE SPECIFIED

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
CONCENTRATE	120
1:3	120

CONTROL

CONTROL

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

NO SUGGESTED CONCENTRATION

CROWLEY CHEMICAL COMPANY AROMATIC SOLVENT #58

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CROWLEY CHEMICAL COMPANY METHYL NAPHTHALENE #5

INGREDIENT --- NAPHTHALENE
APPLICATION -- OIL, GREASE
METALS ----- ALL
NOT BIODEGRADABLE

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

DOBER CHEMICAL CORP. 4190

INGREDIENT --- 2-BUTOXYETHANOL, NaOH, SODIUM META SILICATE
APPLICATION -- OIL, GREASE
METALS ----- ALL METALS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:20	AMBIENT
1:60	AMBIENT
1:100	AMBIENT

DOBER CHEMICAL CORP. 8679

INGREDIENT --- SODIUM HYDROXIDE
APPLICATION -- OIL, GREASE
METALS ----- FERROUS METALS, COPPER
NOT FOR Al, Zn

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
4 OZ/GAL	120
4 OZ/GAL	160
4 OZ/GAL	200
10 OZ/GAL	120
10 OZ/GAL	160
10 OZ/GAL	200
16 OZ/GAL	120
16 OZ/GAL	160
16 OZ/GAL	200

DREW INDUSTRIAL DIVISION DREW OIL AND GREASE REM.

INGREDIENT --- PETROLEUM DISTALLATE ETHYLENE OXIDE, PHOSPHATE ESTER
APPLICATION -- OIL, GREASE
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
CONCENTRATE	AMBIENT
CUT 4 X W/PETRO SOLVENT	AMBIENT

ELGENE CHEMICALS INC. #22 SKIDOO

INGREDIENT --- ALKALI DETERGENT
APPLICATION -- OIL, GREASE, WAX, PAINT
METALS ----- ALL
ETCHES Al

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:5	120
1:5	160
1:5	180

ELGENE CHEMICALS INC. A-CD

INGREDIENT --- PHOSPHORIC ACID
APPLICATION -- OIL, GREASE
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:10 BRASS COPPER	120
1:10 BRASS COPPER	180
1:5 STEEL, AL	120
1:5 STEEL, AL	180

ELGENE CHEMICALS INC. ECONOMISER CF

INGREDIENT --- SODIUM METASILICATE TERPENTAYHDRATE, ETHYLENE GLYCOL BUTYL
THER
APPLICATION -- GREASE, OIL, WAX
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1 OZ/GAL	AMBIENT
6 OZ/GAL	AMBIENT
12 OZ/GAL	AMBIENT
CONCENTRATE	AMBIENT

ELGENE CHEMICALS INC. FABULENE

INGREDIENT --- SODIUM METASILICATE SODIUM HYDROXIDE
APPLICATION -- GREASE, OIL, CARBON, WAX
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:2	160
1:6	160

ELGENE CHEMICALS INC. SAFETY SOLVENT #10

INGREDIENT ---
APPLICATION -- GREASE, OIL
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
NO SUGGESTED CONCENTRATION	

EXXON CHEMICALS AROMATIC 150

INGREDIENT --- NAPHTHA
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS	TEMPERATURE °F

EXXON CHEMICALS

AROMATIC 200

INGREDIENT --- NAPHTHA
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

EXXON CHEMICALS

EXSOL D 80

INGREDIENT --- C11-C13 PARAFFINS, NAPHTHENIC HYDROCARBONS
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

EXXON CHEMICALS

EXXAL 13 TRIDECYL ALCOHOL

INGREDIENT --- TRIDECANOL
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

EXXON CHEMICALS

EXXAL 16 -ISOCETYL ALCOHO

INGREDIENT --- ISOCETYL ALCOHOL
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

EXXON CHEMICALS

EXXAL 20

INGREDIENT --- ISOARACHIDYL ALCOHOL
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

EXXON CHEMICALS

EXXAL L1315

INGREDIENT --- OXO ALCOHOL
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

EXXON CHEMICALS

EXXATE 1000

INGREDIENT --- C10H21OCOCH2
APPLICATION -- REPLACE CHLORINATED HYDROCARBONS
METALS ----- ALL

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

EXXON CHEMICALS

EXXATE 1300

INGREDIENT --- C13H27OCOCH3
APPLICATION -- REPLACE CHLORINATED HYDROCARBONS
METALS ----- ALL

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

EXXON CHEMICALS

EXXATE 600

INGREDIENT --- C6H13OCOCH2

APPLICATION -- REPLACE CHLORINATED HYDROCARBONS

METALS ----- ALL

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

EXXON CHEMICALS

EXXATE 700

INGREDIENT --- C7H15OCOCH2

APPLICATION -- REPLACE CHLORINATED HYDROCARBONS

METALS ----- ALL

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

EXXON CHEMICALS

EXXATE 800

INGREDIENT --- C8H17OCOCH2

APPLICATION -- REPLACE CHLORINATED HYDROCARBONS

METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

EXXON CHEMICALS

EXXATE 900

INGREDIENT --- C9H19OCOCH2

APPLICATION -- REPLACE CHLORINATED HYDROCARBONS

METALS ----- ALL

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

EXXON CHEMICALS

EXXSOL D110

INGREDIENT --- PETROLEUM HYDROCARBON
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

EXXON CHEMICALS

NORPAR 13

INGREDIENT --- C13-C14 PARAFFINS
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

EXXON CHEMICALS

NORPAR 15

INGREDIENT --- C14-C17 PARAFFINS
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

EXXON CHEMICALS

WS 2443 SOLVENT

INGREDIENT --- PETROLEUM DISTILLATE
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

EXXON CHEMICALS

WS 2444 SOLVENT

INGREDIENT --- HYDROCARBON DISTILLATE

APPLICATION --

METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

FINE ORGANICS CORP

COMPOUND CLEANING LIQUID

INGREDIENT ---

APPLICATION --

METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

NO SUGGESTED CONCENTRATION

FINE ORGANICS CORP

SOLVENT EMULSION

INGREDIENT ---

APPLICATION --

METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

NO SUGGESTED CONCENTRATION

FORMULA IV CORPORATION MAGNA IV C-1000

INGREDIENT --- PROPRIETARY
 APPLICATION -- OIL, GREASE EMULSIFIER
 METALS ----- ALL METALS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:15	AMBIENT
1:10	AMBIENT

FREDERICK GUMM CHEM. CLEPO 136-R

INGREDIENT --- SODIUM SILICATE, TERASODIUM, PROPHOSPHATE, SODIUM DODECY
 ENE SULFONATE
 APPLICATION -- OIL, GREASE
 METALS ----- Al, BRASS, Cu, Ni, Ni-Ag, SS, STEEL, TIN, Zn

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1 OZ/GAL Al	170
6 OZ/GAL BRASS	180
8 OZ/GAL Cu	200
8 OZ/GAL Ni	200
6 OZ/GAL Ni-Ag	210

FREDERICK GUMM CHEM. CLEPO 136-R

INGREDIENT ---
 APPLICATION --
 METALS -----
 ***** CONTINUATION OF RECORD *****

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
8 OZ/GAL SS	210
8 OZ/GAL STEEL	210
4 OZ/GAL TIN	200
4 OZ/GAL ZINK	180

FREDERICK GUMM CHEM. CLEPO 204

INGREDIENT --- ALKYL AMINE
APPLICATION -- GREASE, OIL
METALS ----- STEEL, Cu, BRASS

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

FREDERICK GUMM CHEM. CLEPO 644-L

INGREDIENT --- Z-BUTOXY ETHANOL, SODIUM DODECYLBENZENE SULFONATE
APPLICATION -- GREASE, OIL
METALS ----- STEEL, Cu, BRASS
ETCHES Al, MILD ATTACK OF ZINC

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

4% STEEL, Cu	150
4% STEEL, Cu	180
6% STEEL, Cu	150
6% STEEL, Cu	180
3% BRASS	150
3% BRASS	180
5% BRASS	150
5% BRASS	180

FREDERICK GUMM CHEM. SONIC SOAK

INGREDIENT --- MONO ETHANOL AMINE
APPLICATION -- BUFFING & POLISHING RESIDUES OIL
METALS ----- STEEL, Zn, BRASS, Pb, Al

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
2% STEEL	140
2% STEEL	170
2% STEEL	190
3% STEEL	140
3% STEEL	170
3% STEEL	190
0.5% BRASS, Pb, Al	140
0.5% BRASS, Pb, Al	170
0.5% BRASS, Pb, Al	190
2% Zn, BRASS, Pb, Al	140
2% Zn, BRASS, Pb, Al	170
2% Zn, BRASS, Pb, Al	190

GOLDENWEST

WBS

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
NO SUGGESTED CONCENTRATION	

GRAYMILLS CORP.

AQUATENE 330

INGREDIENT --- DOWANOL DPM, ALKALINE DETERGENT
APPLICATION -- OIL, GREASE, WAX
METALS ----- ALL METALS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:4	150
1:4	180
1:9	150
1:9	180

GRAYMILLS CORP.

AQUATENE 571

INGREDIENT --- SODIUM METASILICATE
APPLICATION -- VARNISH, CARBON, OIL, WAX
METALS ----- Al NON FERROUS METALS
CAUTION WITH PLATED METALS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
2 OZ/GAL	180
5 OZ/GAL	180
8 OZ/GAL	180

GRAYMILLS CORP.

AQUATENE 581

INGREDIENT --- ALKALINE
APPLICATION -- CARBON, OIL, WAX, VARNISH
METALS ----- ALLOY STEELS
MAY REMOVE PLATING

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
12 OZ/GAL	200
20 OZ/GAL	200

HOLT LLOYD CORP.

CHEMPRO APC

INGREDIENT --- GLYCOL ETHER, PHOSPHATES, SILICATES
APPLICATION -- GREASE, OIL, WAX, SOIL
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:6	AMBIENT
1:2	AMBIENT

HOMESTEAD INDUSTRIES INC.#49

INGREDIENT --- CAUSTIC SODA
APPLICATION -- OIL, GREASE
METALS ----- ALL
NOT Al

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
19 OZ/GAL	AMBIENT

HOMESTEAD INDUSTRIES INC.#49-S

INGREDIENT --- CAUSTIC SODA
APPLICATION -- OIL, GREASE, PAINT
METALS ----- ALL
NOT Al

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
19 OZ/GAL	AMBIENT

HOMESTEAD INDUSTRIES INC.#65

INGREDIENT --- KOH
APPLICATION -- OIL, GREASE
METALS -----
NOT Al, Mg SOFT METALS, PRESSURE WASHER

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:250	AMBIENT

HOMESTEAD INDUSTRIES INC.AP

INGREDIENT ---
APPLICATION -- MINERAL OIL, GREASE
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
12 OZ/GAL	AMBIENT

HOMESTEAD INDUSTRIES INC.HDL

INGREDIENT --- CAUSTIC POTASH, KOH
APPLICATION -- HEAVY DUTY CLEANING
METALS -----
NOT AL, PRESSURE WASHER

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:250	AMBIENT

HUNTINGTON

J8-10P

INGREDIENT --- ALKALINE
APPLICATION -- GREASE OIL, WAX
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F

HUNTINGTON

LHTS

INGREDIENT ---

APPLICATION -- OIL, GREASE, PAINT

METALS ----- FE, STEEL, BRASS, Pb, BRONZE, CU, Ni, Cd, Mg, SS, Cr

LIQUID HOT TANK STRIPPER

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

1 OZ/GAL

160

3 OZ/GAL

160

6 OZ/GAL

160

HUNTINGTON

ONLINE CE SD

INGREDIENT ---

APPLICATION -- OIL, GREASE, CARBON

METALS ----- ALL

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

HUNTINGTON

SOLVENT EMULTION DEGREASE

INGREDIENT ---

APPLICATION -- OIL, GREASE CARBON

METALS ----- ALL

PRODUCT, ENDS IN SED

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

NO SUGGESTED CONCENTRATION

HUNTINGTON

THUNDER BOLT

INGREDIENT ---
APPLICATION -- GREASE, OIL
METALS ----- ALL
NOT Al

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

1:3

AMBIENT

1:2

AMBIENT

HYDRITE CHEMICAL CO.

HYDRI-CLEAN NPX

INGREDIENT --- TETRA POTASium PYROPHOSPHATE, POTASium HYDROXIDE DODECY
ZENE SULFONIC ACID, PROPYLENE GLYCOL
APPLICATION -- OIL, GREASE, SOIL
METALS ----- STEEL, SS, Fe
NOT FOR Al

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

1:1

100

1:1

130

1:4

100

1:4

130

HYLUBE INC.

ALKAKLEEN 658

INGREDIENT ---
APPLICATION -- GREASE, OIL, RUST, PAINT
METALS ----- STEEL

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

1:10

190

HYLUBE INC.

HYKLEEN 300

INGREDIENT --- ISOPROPANOL 5%
APPLICATION -- OIL, GREASE, WAX
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
CONCENTRATE 1:4	AMBIENT AMBIENT

HYLUBE INC.

HYKLEEN 312

INGREDIENT ---
APPLICATION -- GREASE
METALS ----- AL, NONFERROUS METALS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
NO SUGGESTED CONCENTRATION	

INTERNATIONAL PRODUCTS COMICRO

INGREDIENT --- SODIUM AMMONIUM, TRIETHANOLAMMONIUM, ETHYLEDIAMINE TATE
APPLICATION -- OIL, GREASE, WAX
METALS ----- ALL
MAY ETCH Zn, Al

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
2 OZ/GAL	200

JOHNSON WAX/GEM STATE PAPBIG BARE

INGREDIENT --- ALKALI METASILICATE & CARBONATES, SURFACTANTS

APPLICATION -- DIRT, GREASE, OIL

METALS ----- Fe, SS, CERAMIC, Cr, BRONZE, Zn, Cu, BRASS, Sn, Cd, Pb,

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

1:15

180

JOHNSON WAX/GEM STATE PAPJ-SHOP 500

INGREDIENT --- POTASSIUM CARBONATE, SODIUM METASILICATE, NONYLPHENOL POLYETHYLENE GLYCOL ETHER

APPLICATION -- WIDE VARIETY OF OILS & GREASE

METALS ----- Fe, SS, CERAMIC, Cr, Al, BRONZE, Zn, Cu, BRASS, TN, Cd, Pb

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

1:4

100

JOHNSON WAX/GEM STATE PAPJ-SHOP 600

INGREDIENT --- ETHYLENE GLYCOL MONOBUTYL ETHER, NONYLPHENOL POLYETHYLENE GLYCOL ETHER

APPLICATION -- DEGREASING

METALS ----- Fe, SS, CERAMIC, PLASTIC, CHROME, Al, BRONZE, Zn, Cu, BRASS, Sn, C

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

1:10

100

KIESOW INTERNATIONAL CORPEKASIT D-103

INGREDIENT --- CAUSTIC SODA
APPLICATION -- DESCALING
METALS ----- Fe, STEEL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
7 OZ/GAL	140
7 OZ/GAL	160
7 OZ/GAL	212
15 OZ/GAL	140
15 OZ/GAL	160
15 OZ/GAL	212
30 OZ/GAL	140
30 OZ/GAL	160
30 OZ/GAL	212

KIESOW INTERNATIONAL CORPEKASIT E-231

INGREDIENT --- CAUSTIC SODA, P205
APPLICATION -- ELECTROCLEANER
METALS ----- NON-FERROUS METALS, STEEL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
5 OZ/GAL	95
5 OZ/GAL	140
8 OZ/GAL	95
8 OZ/GAL	140

KIESOW INTERNATIONAL CORPEKASIT S-261

INGREDIENT --- CAUSTIC SODA, P205
APPLICATION -- MULTIPURPOSE
METALS ----- BRASS, Cu

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
6 OZ/GAL	160
6 OZ/GAL	185
8 OZ/GAL	160
8 OZ/GAL	185

KLEER-FLO COMPANY

DEGREASOL 99R

INGREDIENT --- ALIPHATIC HYDROCARBON MIXTURE
APPLICATION -- GREASE, OIL
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

KLEER-FLO COMPANY

DG-5

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

NO SUGGESTED CONCENTRATION

KLEER-FLO COMPANY

HI-T DEGREASER

INGREDIENT --- ALIPHATIC HYDROCARBON MIXTURE
APPLICATION -- GREASE, OIL
METALS ----- ALL

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

LAKE PRODUCTS CO. INC. LAKE-97

INGREDIENT --- SURFACTANTS IN WATER
APPLICATION -- GREASE, OIL, CARBON
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:7	AMBIENT

LEA MANUFACTURING CO. CLEANOL

INGREDIENT --- DIETHANOLAMINE
APPLICATION -- OIL, GREASE
METALS ----- Al, BRASS, Cu, STEEL, Zn

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
2 OZ/GAL	180
2 OZ/GAL	200

M-OIL-FREE CO. CITRIC

INGREDIENT --- ISOPROPANOL
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
CONCENTRATE	AMBIENT

M-OIL-FREE CO.

GS-A-67

INGREDIENT --- SODIUM HYDROXIDE, ISOPROPANOL
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

M-OIL-FREE CO.

M-OIL-FREE #1000

INGREDIENT --- ISOPROPONAL
APPLICATION -- GREASE
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

M-OIL-FREE CO.

ULTRA

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

M-OIL-FREE CO.

ULTRA 1

INGREDIENT ---
APPLICATION --
METALS -----
JOHN HAS MORE DATA

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

NO SUGGESTED CONCENTRATION

M-OIL-FREE CO.,

ULTRA 70

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

M-OIL-FREE CO.

ULTRA 90

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

MAGNUSON PRODUCTS

PERMAG #404

INGREDIENT --- SODIUM HYDROXIDE
APPLICATION -- OIL, GREASE, CARBON
METALS ----- FERROUS METALS
NOT FOR NONFERROUS METALS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
6 OZ/GAL	160
12 OZ/GAL	160

MAN-GILL CHEMICAL

MAGNUSOL 728

INGREDIENT --- PETROLEUM NAPHTHA, 2-BUTOXYETHANOL, DODECYL BENZENE, SULFO
ACID, POTASSIUM HYDROXIDE, CYCLOHEXANOL
APPLICATION -- GREASE, OIL, CARBON
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1-4	AMBEINT

MEASURY COL.

MYCO

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
NO SUGGESTED CONCENTRATION	

MEQQEM

MEQQEM-CLEAN 8512

INGREDIENT --- ALKALINE
APPLICATION -- GREASE
METALS ----- STEEL, Cu, BRASS, Al

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

2%	40
2%	60
2%	90
5%	40
5%	60
5%	90
10%	40
10%	60
10%	90

MEQQEM

MEQQEM-CLEAN 8516

INGREDIENT --- ACID
APPLICATION -- GREASE
METALS ----- Al, BRASS, STEEL

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

2%	20
2%	40
2%	60
5%	20
5%	40
5%	60

MIRACHEM

MIRACHEM 100

INGREDIENT --- detergents, emulsifiers, C9-C12 hydrocarbons
APPLICATION -- GREASE, OIL, WAX, CARBON
METALS ----- ALL

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

3:1	AMBEINT
3:1	180

MITCHELL-BRADFORD, INTERNMI-CLEAN 100

INGREDIENT --- SODIUM HYDROXIDE
APPLICATION -- OIL, GREASE
METALS ----- ALL METALS
NOT FOR Fe, BRONZE, Cu, Sn, NOT Al

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
6 OZ/GAL	65
6 OZ/GAL	100
6 OZ/GAL	160
8 OZ/GAL	65
8 OZ/GAL	100
8 OZ/GAL	160
10 OZ/GAL	65
10 OZ/GAL	100
10 OZ/GAL	160

MITCHELL-BRADFORD, INTERNMI-CLEAN 14

INGREDIENT --- SODIUM METASILICATE
APPLICATION -- CLEANER
METALS ----- STEEL, Cu

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
8 OZ/GAL	180
10 OZ/GAL	180

MITCHELL-BRADFORD, INTERNMI-CLEAN 31

INGREDIENT --- SODIUM HYDROXIDE
APPLICATION -- OIL, GREASE, METAL OXIDES
METALS ----- ALL METALS
NOT Al

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
6 OZ/GAL	160
10 OZ/GAL	160
16 OZ/GAL	160

MITCHELL-BRADFORD, INTERNMI-CLEAN 59

INGREDIENT --- SODIUM TRIPOLYPHOSPHATE, TETRASODIUM PYROPHOSPHATE
APPLICATION -- CLEANER
METALS ----- Al

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
6 OZ/GAL	130
6 OZ/GAL	160
8 OZ/GAL	130
8 OZ/GAL	160

OAKITE PRODUCTS INC. OAKITE 162

INGREDIENT --- sodium cabonate, sodium hydroxide, sodium metasilicate
APPLICATION -- CLEANING MIXED METALS
METALS ----- STEEL, Cu, BRASS, BRONZE

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
4 OZ/GAL	120
4 OZ/GAL	180
4 OZ/GAL	150
8 OZ/GAL	120
8 OZ/GAL	180
8 OZ/GAL	150
10 OZ/GAL	120
10 OZ/GAL	180
10 OZ/GAL	150

OAKITE PRODUCTS INC.

OAKITE 2327

INGREDIENT --- sodium carbonate, sodium metasilicate, sodium hydroxide
d rosin, hexylene glycol,

APPLICATION -- OIL, GREASE

METALS ----- Cu, BRASS, BRONZE, Zn, Sn, FERROUS METALS

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

4 OZ/GAL	160
4 OZ/GAL	180
4 OZ/GAL	200
8 OZ/GAL	160
8 OZ/GAL	180
8 OZ/GAL	200

OAKITE PRODUCTS INC.

OAKITE 24

INGREDIENT --- sodium metasilicate, sodium hydroxide, sodium carbonate

APPLICATION -- OILS, GREASE BASED SOLIDS

METALS ----- STEEL, Cu, BRASS

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

4 OZ/GAL	160
4 OZ/GAL	180
4 OZ/GAL	200
8 OZ/GAL	160
8 OZ/GAL	180
8 OZ/GAL	200
10 OZ/GAL	160
10 OZ/GAL	180
10 OZ/GAL	200

OAKITE PRODUCTS INC.

OAKITE ANOPREP

INGREDIENT --- sodium metasilicate, sodium hydroxide, sodium carbonate
ium tripoly phosphate,

APPLICATION -- SHOP SOILS

METALS ----- STEEL, Cu

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

2 OZ/GAL	100
2 OZ/GAL	130
2 OZ/GAL	160
5 OZ/GAL	100
5 OZ/GAL	130
5 OZ/GAL	160
8 OZ/GAL	100
8 OZ/GAL	130
8 OZ/GAL	160

OAKITE PRODUCTS INC.

OAKITE DYNADET

INGREDIENT --- sodium hydroxide, tetrasodium polyethoxyethanol, dipent

APPLICATION -- CLEANING BEFORE ELECTROPLATING

METALS ----- STEEL, SS, Mg

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

OAKITE PRODUCTS INC. OAKITE HD 126

INGREDIENT --- sodium hydroxide, sodium carbonate, tetrasodium pyrophosphate, ethoxylated amphoteric sodium salt,
APPLICATION -- HEAVY DUTY CLEANER
METALS ----- STEEL, SS, MG
NOT FOR Al, Zn, OR BRASS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
4 OZ/GAL	170 C
4 OZ/GAL	190 C
7 OZ/GAL	170 C
7 OZ/GAL	190 C
10 OZ/GAL	170 C
10 OZ/GAL	190 C

OAKITE PRODUCTS INC. RUST STRIPPER

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
NO SUGGESTED CONCENTRATION	

ORANGE-SOL INCORPERATED DE-SOLV-IT

INGREDIENT --- PETROLEUM DISTALLATE
APPLICATION -- OIL, GREASE, WAX
METALS ----- ALL METALS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
CONCENTRATE	AMBIENT

P-D-680

P-D-680

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

NO SUGGESTED CONCENTRATION

PACIFIC CHEMICAL

B-82

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

PACIFIC CHEMICAL

FIST

INGREDIENT ---
APPLICATION -- OIL, GREASE
METALS ----- ALL

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

2 OZ/GAL
4 OZ/GAL
6 OZ/GAL

AMBIENT
AMBIENT
AMBIENT

PACIFIC CHEMICAL

MASTER MHW

INGREDIENT --- SODIUM SILICATE, SODIUM CARBONATE
APPLICATION --
METALS ----- Al, IRON, TIN
BRUSH OR GUN APPLICATION

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

1 OZ/GAL

AMBIENT

PACIFIC CHEMICAL

PACE S-L

INGREDIENT --- SODIUM METASILICATE, SODIUM CARBONATE
APPLICATION -- OILS
METALS ----- ALL

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

2 OZ/GAL

AMBIENT

3 OZ/GAL

AMBIENT

PACIFIC CHEMICAL

RIDDALL

INGREDIENT --- SODIUM METASILICATE, ETHYLENE, GLYCOL, N.BUTYL ETHER
APPLICATION -- GREASE, OIL, WAX
METALS ----- ALL
BRUSH APPLICATION

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

1:4

AMBIENT

PANTHER CHEMICAL CO. 759

INGREDIENT ---
APPLICATION -- OIL, WAX
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

PANTHER CHEMICAL CO. AS-33

INGREDIENT --- SODIUM HYDROXIDE
APPLICATION -- OILS, GREASE, PAINT
METALS ----- FERROUS METALS

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

1 OZ/GAL	180 F
1 OZ/GAL	200 F
4 OZ/GAL	180 F
4 OZ/GAL	200 F

PANTHER CHEMICAL CO. CR-138

INGREDIENT --- CRESYLIC ACID
APPLICATION -- OIL, GREASE, PAINT, CARBON
METALS ----- ALL METALS
TWO PHASE, MIX WELL BEFORE USE

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

PANTHER CHEMICAL CO. CR-140

INGREDIENT --- CRESYLIC ACID
APPLICATION -- OIL, GREASE, PAINT, CARBON
METALS ----- ALL METALS
TWO PHASE, MIX WELL BEFORE USING

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
CONCENTRATE	AMBIENT

PANTHER CHEMICAL CO. RR 50

INGREDIENT --- SODIUM HYDROXIDE
APPLICATION -- OIL, GREASE, RUST, PAINT
METALS ----- FERROUS METALS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1.5 LB/GAL	180 F
1.5 LB/GAL	200 F

PARKER CHEMICAL PARCO CLEANER 2033

INGREDIENT --- MILD ALKOLINE
APPLICATION --
METALS ----- STEEL, Al

SUGGESTED CONCENTRATIONS	TEMPERATURE °F

PARKER CHEMICAL

PARCO CLEANER 2053

INGREDIENT --- STRONG ALKALINE

APPLICATION --

METALS ----- STEEL

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

PATCLIN CHEMICAL CO.

#309

INGREDIENT --- SODIUM HYDROXIDE

APPLICATION -- OIL, GREASE

METALS ----- BRASS, Cu, STEEL, Mg

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

6	OZ/GAL	150
6	OZ/GAL	170
6	OZ/GAL	210
9	OZ/GAL	150
9	OZ/GAL	170
9	OZ/GAL	210
12	OZ/GAL	150
12	OZ/GAL	170
12	OZ/GAL	210

PATCLIN CHEMICAL CO. #348

INGREDIENT --- SODIUM HYDROXIDE
APPLICATION -- OIL, GREASE
METALS ----- STEEL, Mg, Cu

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
8 OZ/GAL	150
8 OZ/GAL	180
8 OZ/GAL	210
10 OZ/GAL	150
10 OZ/GAL	180
10 OZ/GAL	210
12 OZ/GAL	150
12 OZ/GAL	180
12 OZ/GAL	210

PATCLIN CHEMICAL CO. #380

INGREDIENT --- SODIUM HYDROXIDE
APPLICATION -- SCALE
METALS ----- STEEL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1 Lbs/GAL	AMBIENT
1 Lbs/GAL	100
1 Lbs/GAL	200
3 Lbs/GAL	AMBIENT
3 Lbs/GAL	100
3 Lbs/GAL	200

PATCLIN CHEMICAL CO. #490

INGREDIENT --- DIETHYLENE GLYCOL MONOBUTYL ETHER
APPLICATION -- GREASE, OIL
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:4	AMBIENT
1:10	AMBIENT

PATCLIN CHEMICAL CO. 359

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
NO SUGGESTED CONCENTRATION	

PATCLIN CHEMICAL CO. 396

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
NO SUGGESTED CONCENTRATION	

PATCLIN CHEMICAL CO. 73W

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

NO SUGGESTED CONCENTRATION

PATCLIN CHEMICAL CO. PATCLIN

INGREDIENT ---
APPLICATION -- 73W
METALS -----
JOHN HAS MORE DATA

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

NO SUGGESTED CONCENTRATION

PENETONE

CITRI KLEEN

INGREDIENT --- ETHANOLAMINE
APPLICATION -- OIL, GREASE, CARBON
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

NO SUGGESTED CONCENTRATION

PETROFIRM INC.

BIOACT INDUSTRIAL DG1

INGREDIENT --- TERPENE HYDROCARBONS
APPLICATION -- OIL, GREASE
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
CONCENTRATE	AMBIENT
75%	AMBIENT

PHENOL

PHENOL

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
NO SUGGESTED CONCENTRATION	

PROGRESS CHEMICAL INC. #611

INGREDIENT --- ALKALINE
APPLICATION -- CLEANER
METALS ----- NON-FERROUS METALS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1.0 OZ/GAL	AMBIENT
2.5 OZ/GAL	AMBIENT
4.0 OZ/GAL	AMBIENT

PROGRESS CHEMICAL INC. #65

INGREDIENT --- ALKALINE
APPLICATION -- CLEANING
METALS ----- FERROUS AND NON FERROUS METALS

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

1 OZ/GAL	AMBIENT
2 OZ/GAL	AMBIENT
3 OZ/GAL	AMBIENT

PROGRESS CHEMICAL INC. AC-1

INGREDIENT --- SURFACTANTS
APPLICATION -- CLEANING
METALS ----- Al

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

4 OZ/GAL	150
4 OZ/GAL	180
6 OZ/GAL	150
6 OZ/GAL	180
8 OZ/GAL	150
8 OZ/GAL	180

PROGRESS CHEMICAL INC. L-365

INGREDIENT --- POTASSIUM HYDROXIDE
APPLICATION -- CLEANING
METALS ----- FERROUS AND NON FERROUS METALS

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

1 OZ/GAL	AMBIENT
2 OZ/GAL	AMBIENT
3 OZ/GAL	AMBIENT

ROCHESTER MIDLAND

SE-354

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

NO SUGGESTED CONCENTRATION

ROCHESTER MIDLAND

SE-358

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

NO SUGGESTED CONCENTRATION

ROCHESTER MIDLAND

SE-374

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

NO SUGGESTED CONCENTRATION

ROCHESTER MIDLAND

SE377C

INGREDIENT --- D-LIMONENE
APPLICATION -- OIL, GREASE, FATS
METALS ----- ALL METALS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:2	AMBIENT
1:4	AMBIENT
1:7	AMBIENT

SIMPLE GREEN

GREEN

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
NO SUGGESTED CONCENTRATION	

SUTTON CORP.

TOPSALL

INGREDIENT --- DETERGENT
APPLICATION -- OIL, GREASE
METALS ----- ALL
NOT A1

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1-5	AMBEINT

TELSTAR INDUSTRIES

TELE-SOLV

INGREDIENT --- GLYCOL ETHER BUTYL CELLUSOLVE, POTASSIUM HYDROXIDE
APPLICATION -- GREASE, OIL,
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:2	AMBEINT
1:10	AMBEINT

TITAN CHEMICAL

OIL-FLO

INGREDIENT --- AROMATIC HYDROCARBON
APPLICATION -- OIL, GREASE,
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
CONCENTRATE	AMBEINT

TITAN GOLD

GOLD

INGREDIENT ---
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
NO SUGGESTED CONCENTRATION	

TRI TON

HEMO-SOL

INGREDIENT --- 4-ISOPROPENYL-1-METHYLCYCLOHEXENE
 APPLICATION -- OIL, GREASE, WAX
 METALS ----- ALL
 FLASH POINT OF 115 F

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
CONCENTRATE	AMBIENT

TRICHLOROETHANE

TRICHLOROETHANF

INGREDIENT ---
 APPLICATION --
 METALS -----

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
NO SUGGESTED CONCENTRATION	

TWIN SPECIALTIES CORP. CLEANER 54-TWIN INDUSTRIA

INGREDIENT --- POTASSIUM HYDROXIDE, GLYCOL ETHER BLEND, SODIUM SILCATE
 APPLICATION -- OIL, GREASE, SOIL
 METALS -----

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:3	AMBIENT
1:5	AMBIENT

TWIN SPECIALTIES CORP. TWIN CITRON CLEANER 100

INGREDIENT --- CITRUS TERPENES & SURFACTANTS
APPLICATION -- DEGREASER
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
CONCENTRATE	AMBIENT

U.S. POLYCHEMICAL CORP. ST-21 POLY SPRAY JET

INGREDIENT --- ETHYLENE GLYCOL MONO BUTYL ETHER ISOPROPYL ALCOHOL
APPLICATION -- CUTTING OILS, DEGREASING, WAX
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1:10	AMBIENT
1:12	160

UNITED LABORATORIES UNITED 392

INGREDIENT --- d-1,8(9)-p-MENTHADIENE
APPLICATION -- GREASE, OIL
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
CONCENTRATE	AMBIENT

UNITED LABORATORIES

UNITED 395

INGREDIENT --- d-1,8(9)-p-MENTHADIENE

APPLICATION -- GREASE, OIL

METALS ----- ALL

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

CONCENTRATE

AMBIENT

VAN STRAATEN CHEM CO.

21-271-A

INGREDIENT --- TRIETHANOLAMINE

APPLICATION -- NEUTRAL SOAK CLEANER

METALS ----- ALUMINUM AND 7000 SERIES ALLOYS

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

2 OZ/GAL

AMBIENT

2 OZ/GAL

100

2 OZ/GAL

180

6 OZ/GAL

AMBIENT

6 OZ/GAL

100

6 OZ/GAL

180

10 OZ/GAL

AMBIENT

10 OZ/GAL

100

10 OZ/GAL

180

VAN STRAATEN CHEM CO. 3625

INGREDIENT --- MONOETHANOLAMINE 5-10%, POTASIUH HYDROXIDE 5-10%
APPLICATION -- SPRAY & SOAK CLEANER
METALS ----- COMMON INDUSTRIAL METALS

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1.0 OZ/GAL	AMBIENT
1.0 OZ/GAL	100
1.0 OZ/GAL	180
2.5 OZ/GAL	AMBIENT
2.5 OZ/GAL	100
2.5 OZ/GAL	180
4.0 OZ/GAL	AMBIENT
4.0 OZ/GAL	100
4.0 OZ/GAL	180

VAN STRAATEN CHEM CO. VANSTAATEN CUTTER

INGREDIENT --- POTASSIUM HYDROXIDE
APPLICATION -- FLOORS, MACHINERY AND PRODUCTION PARTS
METALS ----- ANY SURFACE NOT HARMED BY WATER

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
1%	AMBIENT
2%	AMBIENT

ZEP MANUFACTURING CO. BIG ORANGE

INGREDIENT --- D-LIMONENE, NONYLPHENOXYPOLY ETHANOL
APPLICATION -- OIL, GREASE
METALS ----- ALL

SUGGESTED CONCENTRATIONS	TEMPERATURE °F
2 OZ/GAL	AMBIENT
CONCENTRATE	AMBIENT

ZEP MANUFACTURING CO. PENETONE

INGREDIENT ----
APPLICATION --
METALS -----

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

NO SUGGESTED CONCENTRATION

ZEP MANUFACTURING CO. ZEP 940

INGREDIENT --- SODIUM METASILICATE
APPLICATION -- OILS, GREASE, WAX
METALS ----- FERROUS METALS
NOT SOFT METALS

SUGGESTED CONCENTRATIONS

TEMPERATURE °F

4 OZ/GAL
8 OZ/GAL
12 OZ/GAL

AMBIENT
AMBIENT
AMBIENT

APPENDIX E

SOLVATION TEMPERATURES

These tables contain the solvation temperature for each solvent. It was established as the temperature at which a 0.5-gram sample of masking wax was dissolved in the solvent.

TABLE E-1. BIODEGRADABLE SOLVENTS SOLVANTION TEMPERATURE POINTS

Company	Product	Degrees F Concentration
3 D INC.	3D SUPREME	72 1:3
	CITRIGOLD	72 1:1
	SIEGE	72 1:4
BARTLETT CHEMICAL INC.	DOLPHIN TPS CODE 219	72 1:10
	DOLPHIN WSD CODE 207	72 4 OZ/GAL
	TOBY CODE 230	80 1:3
BIO-TEK INC.	134 HI-SOLV	72 CONCENTRATE
	SAFTEY SOLVENT DEGREASER	72 CONCENTRATE
BRULIN	711 SC	72 1:3
	815 QR	89 1:10
	AQUA SAFE	72 1:5
	CL-500	160 8 OZ/GAL
	FORMULA 512M	72 1:4
	NATURE-SOL 100	72 CONCENTRATE
BUILD ALL	BAC #137	115 10%
CABOT CHEMICAL CORP.	X-166	200 1:20 >200
CALLA CHEMICAL CORP.	CALLA 301	72 1:1
	CALLA 301-A	72 1:1
	CALLA 301-A-LEMON	72 1:1
	CALLA 800	72 CONCENTRATE
CROWLEY CHEMICAL COMPANY	METHYL NAPHTHALENE #5	72 CONCENTRATE
DOBER CHEMICAL CORP.	4190	72 1:20
	8679	80 16 OZ/GAL
DREW INDUSTRIAL DIVISION	DREW OIL AND GREASE REM.	72 CONCENTRATE
ELGENE CHEMICALS INC.	#22 SKIDOO	100 1:5
	A-CD	120 1:5
	ECONOMISER CF	72 CONCENTRATE
EXXON CHEMICALS	EXXATE 1000	72 CONCENTRATE
	EXXATE 1300	72 CONCENTRATE
	EXXATE 600	72 CONCENTRATE
	EXXATE 700	72 CONCENTRATE
	EXXATE 800	72 CONCENTRATE
		72 CONCENTRATE
FORMULA IV CORPORATION	MAGNA IV C-1000	200 1:10 >200
FREDERICK GUMM CHEM.	CLEPO 136-R	72 8 OZ/GAL
	CLEPO 204	200 8 OZ/GAL >200
	CLEPO 644-L	72 6% NOT VISIBLE
	SONIC SOAK	72 3%

TABLE E-1. BIODEGRADABLE SOLVENTS SOLVANTION TEMPERATURE POINTS (CONTINUED)

Company	Product	Degrees F Concentration
GRAYMILLS CORP.	AQUATENE 330 AQUATENE 571 AQUATENE 581	72 1:4 124 8 OZ/GAL 168 20 OZ/GAL
HOLT LLOYD CORP.	CHEMPRO APC	72 1:2
HOMESTEAD INDUSTRIES INC	#49 #49-S #65 AP HDL	165 19 OZ/GAL 200 19 OZ/GAL 200 1:250 >200 72 12 OZ/GAL 200 1:250 >200
HUNTINGTON	LHTS ONLINE CE SD THUNDER BOLT	85 6 OZ/GAL 72 CONCENTRATE 72 1:2
HYDRITE CHEMICAL CO.	HYDRI-CLEAN NPX	72 1:1
INTERNATIONAL PRODUCTS CO	MICRO	200 2 OZ/GAL >200
JOHNSON WAX/GEM STATE PAP	BIG BARE J-SHOP 500 J-SHOP 600	92 1:15 72 1:4 72 1:10
KIESOW INTERNATIONAL CORP	EKASIT D-103 EKASIT E-231 EKASIT S-261	200 30 OZ/GAL >200 153 8 OZ/GAL 124 8 OZ/GAL
LAKE PRODUCTS CO. INC.	LAKE-97	72 1:7
LEA MANUFACTURING CO.	CLEANOL	108 2 OZ/GAL
MAGNUSON PRODUCTS	PERMAG #404	72 12 OZ/GAL
MEQQEM	MEQQEM-CLEAN 8512 MEQQEM-CLEAN 8516	142 10% 145 5%
MITCHELL-BRADFORD, INTERN	MI-CLEAN 100 MI-CLEAN 14 MI-CLEAN 31 MI-CLEAN 59	125 10 OZ/GAL 82 10 OZ/GAL 128 16 OZ/GAL 80 8 OZ/GAL
OAKITE PRODUCTS INC.	OAKITE 162 OAKITE 2327 OAKITE 24 OAKITE ANOPREP OAKITE DYNADET OAKITE HD 126	104 10 OZ/GAL 89 8 OZ/GAL 72 10 OZ/GAL 92 8 OZ/GAL 90 8 OZ/GAL 72 10 OZ/GAL

TABLE E-1. BIODEGRADABLE SOLVENTS SOLVANTION TEMPERATURE POINTS (CONTNIUED)

<u>Company</u>	<u>Product</u>	<u>Degrees F Concentration</u>
ORANGE-SOL INCORPERATED	DE-SOLV-IT	72 CONCENTRATE
PACIFIC CHEMICAL	FIST	90 6 OZ/GAL
	MASTER MHW	108 10 OZ/GAL
	PACE S-L	100 3 OZ/GAL
	RIDDALL	72 1:4
PANTHER CHEMICAL CO.	AS-33	89 4 OZ/GAL
	RR 50	85 1.5 LB/GAL
PARKER CHEMICAL	PARCO CLEANER 2033	85 8 OZ/GAL
	PARCO CLEANER 2053	78 8 OZ/GAL
PATCLIN CHEMICAL CO.	#309	89 12 OZ/GAL
	#348	91 12 OZ/GAL
	#380	200 3 LBS/GAL >200
	#490	72 1:4
PETROFIRM INC.	BIOACT INDUSTRIAL DG1	72 CONCENTRATE
PROGRESS CHEMICAL INC.	#611	98 4 OZ/GAL
	#65	109 3 OZ/GAL
	L-365	72 1:3
ROCHESTER MIDLAND	SE377C	72 1:2
U.S. POLYCHEMICAL CORP.	ST-21 POLY SPRAY JET	86 1:10
VAN STRAATEN CHEM CO.	21-271-A	200 10 OZ/GAL >200
ZEP MANUFACTURING CO.	BIG ORANGE	72 CONCENTRATE
	ZEP 940	91 12 OZ/GAL
	ZEPRIDE	72 1:3

APPENDIX F
SOLUBILITY DATA

APPENDIX F

SOLUBILITY DATA

These tables contain the data on solubility of masking wax in each solvent. They were established using McCoy's Method.

BIODEGRADABLE SOLVENT PROGRAM SOLUBILITY TESTS

Company Product	Conditions	Solubility
3 D INC. 3D SUPREME	1-3 @ 180	1%
3 D INC. CITRIGOLD	CONCENT @ 140	18%
	CONCENT @ 160	24%
	CONCENT @ 180	88%
	1:1 @ 140	35%
	1:1 @ 160	49%
	1:1 @ 180	88%
3 D INC. SIEGE	1:4 @ 160	0%
BIO-TEK INC. 134 HI-SOLV	CONCENT @ AMBIENT	15%
	CONCENT @ 140	20%
BIO-TEK INC. SAFTEY SOLVENT DEGREASER	CONCENT @ AMBIENT	12%
	CONCENT @ 140	79%
BRULIN AQUA SAFE	1:5 @ 160	0%
	1:10 @ 160	0%
BRULIN NATURE-SOL 100	CONCENT @ AMBIENT	31%
	CONCENT @	0%
	CONCENT @ 140	97%
CALLA CHEMICAL CORP CALLA 301-A-LEMON	1:4 @ 120	0%
	1:1 @ 100	0%
	CONCENT @ 140	0%
CROWLEY CHEMICAL COMPANY METHYL NAPHTHALENE #5	CONCENT @ AMBIENT	12%
DOBER CHEMICAL CORP. 8679	4 OZ/GA @ 200	11%
	16 OZ/G @ 120	0%
DREW INDUSTRIAL DIVISION DREW OIL AND GREASE REM.	CONCENT @ AMBIENT	4%
ELGENE CHEMICALS INC. ECONOMISER CF	CONENTR @ AMBIENT	0%
	CONCENT @ 140	0%
ELGENE CHEMICALS INC. FABULENE	1:2 @ 160	1%

BIODEGRADABLE SOLVENT PROGRAM SOLUBILITY TESTS (CONTINUED)

Company Product	Conditions	Solubility
EXXON CHEMICALS EXXATE 1000	CONCENT @ AMBIENT CONCENT @ 100 CONCENT @ 140	14% 49% 95%
EXXON CHEMICALS EXXATE 1300	CONCENT @ AMBIENT CONCENT @ 140	6% 78%
EXXON CHEMICALS EXXATE 600	CONCENT @ AMBIENT CONCENT @ 100 CONCENT @ 140	14% 92% 91%
EXXON CHEMICALS EXXATE 700	CONCENT @ AMBIENT CONCENT @ 100 CONCENT @ 140	9% 40% 99%
EXXON CHEMICALS EXXATE 800	CONCENT @ AMBIENT CONCENT @ 140	5% 95%
EXXON CHEMICALS EXXATE 900	CONCENT @ AMBIENT CONCENT @ 140	5% 84%
FORMULA IV CORPORATION MAGNA IV C-1000	1:15 @ AMBIENT 1:10 @ AMBIENT 1:10 @ 100 1:10 @ 140	0% 0% 0% 99%
GRAYMILLS CORP. AQUATENE 330	1:4 @ 150 1:4 @ 180	21% 31%
GRAYMILLS CORP. AQUATENE 571	8 OZ/GA @ 180	0%
GRAYMILLS CORP. AQUATENE 581	20 OZ/G @ 200	8%
HOLT LLOYD CORP. CHEMPRO APC	1:2 @ AMBIENT 1:2 @ 140 1:6 @ 140	1% 0% 0%

BIODEGRADABLE SOLVENT PROGRAM SOLUBILITY TESTS (CONTINUED)

Company Product	Conditions	Solubility
HOMESTEAD INDUSTRIES INC. #49-S	19 OZ/G @ AMBIENT 19 OZ/G @ 140	0% 0%
HOMESTEAD INDUSTRIES INC. #65	1:250 @ AMBIENT 1:250 @ 140	0% 0%
HYDRITE CHEMICAL CO. HYDRI-CLEAN NPX	1:1 @ 100 1:1 @ 130	20% 87%
HYLUBE INC. HYKLEEN 300	CONCENT @ AMBIENT 1:4 @ AMBIENT CONCENT @ 140	0% 0% 0%
INTERNATIONAL PRODUCTS COMICRO	2 OZ/GA @ 200	0%
ORANGE-SOL INCORPORATED DE-SOLV-IT	CONCENT @ AMBIENT CONCENT @ 100 CONCENT @ 140	18% 60% 99%
PACIFIC CHEMICAL RIDDALL	1:4 @ AMBIENT 1:4 @ 140	0% 3%
PATCLIN CHEMICAL CO. #490	1:4 @ AMBIENT 1:4 @ 140	3% 19%
PETROFIRM INC. BIOACT INDUSTRIAL DG1	CONCENT @ AMBIENT CONCENT @ CONCENT @ 140	20% 0% 97%
ROCHESTER MIDLAND SE377C	1:2 @ AMBIENT 1:2 @ 140 1:4 @ 140	13% 32% 44%
U.S. POLYCHEMICAL CORP. ST-21 POLY SPRAY JET	1:10 @ AMBIENT	0%
VAN STRAATEN CHEM CO. 21-271-A	6 OZ/G @ AMBIENT 10 OZ/G @ 180 2 OZ/G @ 180 10 OZ/G @ 100	4% 0% 4% 0%

BIODEGRADABLE SOLVENT PROGRAM SOLUBILITY TESTS (CONTINUED)

Company Product	Conditions	Solubility
ZEP MANUFACTURING CO. BIG ORANGE	CONCENT @ AMBIENT CONCENT @ 140 2 OZ/GA @ 140	40% 83% 2%
ZEP MANUFACTURING CO. ZEP 940	4 OZ/GA @ AMBIENT 8 OZ/GA @ AMBIENT 12 OZ/G @ AMBIENT 12 OZ/G @ 100 12 OZ/G @ 140	0% 0% 0% 0% 0%
ZEP MANUFACTURING CO. ZEPRIDE	1:3 @ 160 1:5 @ 160	0% 1%